

"Proteins are different with regard to physico-chemical properties. When preparing a pharmaceutical preparation which should be physico-chemical acceptable, and stable for a long time, consideration cannot only be taken to the physiological properties of the protein but also other aspects must be considered such as the industrial manufacture, easy handling for the patient and safety for the patient. **The results of these aspects are not predictable when testing different formulations and there often is a unique solution for each protein,**" (emphasis added).

Osterberg points out that different proteins are different in their physico-chemical properties and thus for each protein or class of proteins an individual solution has to be developed and thus it cannot be predicted that the same formulation will be useful for a different class of proteins.

Manning (Pharmaceutical Research, Vol. 6, No. 11, 1989, p. 903-918) is a general article related to the stability of proteinaceous pharmaceuticals. On page 913, left column, first sentence of the last paragraph, it is stated that "protein stability encompasses many complicated and interrelated chemical and physical processes". From this it can be concluded that for every protein or class of proteins an individual solution has to be found due to different physical and chemical constraints.

Osterberg's and Manning's conclusions are supported by the fact that different substances are indicated as good stabilizers in some references and as not useful as a stabilizer in other references. For example, Kunihiro (EP 0 689 843) page 4, line 4 - 7, indicates that the combination of soluble thrombomodulin together with albumin, purified gelatin, glycine, glucose or mannitol **failed** to exhibit sufficient long term stability. Thus, this document contradicts the contention in the office action that Michaelis' teaching can be applied to any and all pharmaceutical

preparations. Kunihiro teaches away from the current invention in that the combination of an amino acid with a sugar had no beneficial effect on stability.

Hanson (chapter 7 in *Stability of Protein Pharmaceuticals*, 1992) indicates on page 217, second paragraph, line 6 to 7 that "Ornithine, aspartic acid, glutamic acid, alanine and glycine did not stabilize" intravenous immunoglobulin preparations. Thus, Hanson also contradicts the contention in the office action that Michaelis' teaching can be applied to any and all pharmaceutical preparations and teaches away from the current invention which shows that the use of the amino acids listed in Hanson improve the stability of the lyophilized antibody formulation.

Metzner (EP 0 733 702) which is equivalent to US Patent No. 6,204,036 indicates that histidine and glutamic acid alone, even without further additives, show sufficient stabilization (page 3, line 9, of the German text, column 5, lines 56-58 of the US text). In contrast to Metzner, Michaelis (WO 94/14465) states on page 10, lines 4 to 7 of the German WO 94/14465 that the addition of glutamic acid has no significant impact on the storage stability. Both Metzner and Michaelis also indicate that the surfactant had no impact on storage stability (Metzner page 3, lines 42-43 or col. 6, lines 48-50 in the U.S. Patent, Michaelis page 9, last paragraph of WO 94/14465) but the present inventors have found that the surfactant does affect stability in the present invention. Thus, formulations for stabilizing different pharmaceutical preparations clearly cannot be generalized.

Nema (*J. Parent Sci. Technol.*, 47, p. 76-83, 1993) states on page 81, left column, last sentence of the first paragraph: "A surprising result was obtained with trehalose, a disaccharide which is considered by many workers to be one of the best

cryoprotectants, but proved to be ineffective in this study at a concentration of 5%w/v". This statement also supports the conclusion of the non-transferability of formulations to different classes of proteins.

Three things can be concluded from the above discussed references:

- 1) Though there are diverse citations showing that the use of a single compound can improve the stability of formulations markedly, there is no suggestion that a combination of different compounds discussed in different references will result in a formulation with further improved stability. Furthermore there is no hint in these documents as to the particular combination of compounds as described in the current invention.
- 2) As can be seen from these references, it is not possible to transfer the composition of a formulation useful with one class of proteins or with one protein to other proteins. It is not probable or even predictable that such a transfer might be successful.
- 3) There are no cited documents that suggest or disclose that a formulation for stabilizing a non-antibody protein can be used for the stabilization of a lyophilized antibody preparation.

Applicants also point out that Michaelis shows amino sugar containing preparations in Example 5. From table 6 and 7 it can be seen that a combination containing G-CSF plus a surfactant plus an amino sugar plus one amino acid has poor stability compared to formulations containing an amino sugar, a second non-amino sugar and optionally an amino acid. Thus Michaelis does not suggest the

combination as claimed by the current application which uses an amino sugar, at least one amino acid and a surfactant to stabilize antibodies. Thus, even if one skilled in the art were to combine Michaelis with Andya (which as discussed above, they would not) they would not arrive at the present invention.

Applicants contend that one skilled in the art would not expect Michaelis' formulation to be useful for any and all pharmaceutical preparations as different proteins require different stabilization agents and there is no reason to believe that Michaelis' formulation would stabilize antibody preparations. In addition, Michaelis found that a preparation similar to the present invention (which uses an amino sugar, at least one amino acid and a surfactant) resulted in less stability for G-CSF. In view of the above discussion, applicants request that this rejection be withdrawn.

Applicants respectfully submit that all of claims 13, 15-18 and 22-36 are now in condition for allowance. If it is believed that the application is not in condition for allowance, it is respectfully requested that the undersigned attorney be contacted at the telephone number below.

In the event this paper is not considered to be timely filed, the Applicant respectfully petitions for an appropriate extension of time. Any fee for such an extension together with any additional fees that may be due with respect to this paper may be charged to Counsel's Deposit Account No. 02-2135.

Respectfully submitted,

By

A handwritten signature in black ink, appearing to read 'M. C. Kitts', is written over the printed name.

Monica Chin Kitts  
Attorney for Applicant  
Registration No. 36,105  
ROTHWELL, FIGG, ERNST & MANBECK  
1425 K. Street, Suite 800  
Washington, D.C. 20005  
Telephone: (202) 783-6040

MCK/cb